The ESA-European Commission Earth System Science Initiative

Need for an urgent and collective response…

EC-ESA Joint Earth System Science Initiative

*"…. **to jointly advance Earth system science** and its contribution **to respond to the global challenges that society is facing** in the onset of this century"*

*The unique set of **grand challenges** that humankind is facing require more than ever that scientists advance their understanding of the planet, its processes and its interactions with human activities and translate that knowledge into novel solutions for society.*

To effectively respond to the major challenges in front of us, we need a major scientific and institutional collaboration effort…

Coordinated set of EC HE calls and ESA ITTs

Programmatic alignment and complementarity

Fostering collaborative research and partnerships

New mechanisms to foster collaboration across ESA and EC projects

Fostering scientific dialogue and networking

Continuous effort to reinforce the dialogue across the community

EC-ESA Earth System Science Initiative
How it works, practically 1: Networking

More than **1600** scientists

- Bringing communities together
- Sharing knowledge
- Sharing ideas
- Community building
- Assessing progress
- Identifying priorities

EC-ESA Earth System Science Initiative
How it works, practically 2: Co-programming

FutureEO

15+ Topics EUR ~50Mio in FutureEO SG 1 and 2 with dedicted WPs and funding for collaboration.

New ESA satellites and novel dedicated data and EO-based science results

Horizon Europe

13 Topics ~EUR 160 Mio in HE WP 2023-2024 with enhanced obligations for collaboration

Wide science scope, modeling, in-situ observations, iterdisciplinary

EC-ESA Earth System Science Initiative
How it works, practically 3: EC-ESA synergy clusters

Ensure joint results are beyond the scope of each single projects…
We need practical mechanism and dedicated funding to make this happen…

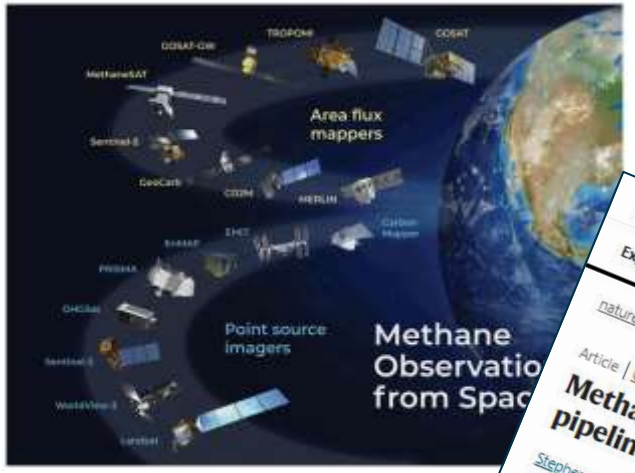
- **ESA and RTD dedicated efforts to bring teams together: Collocation meetings…**
- **Identification of concrete outputs and collaborative actions…**
- **Active follow on of activities and opportunities…**
- **Additional dedicated funding (ESA CNNs) for focused joint developments…**

Coordination
Joint work packages
Joint deliverables
Shared data, knowledge

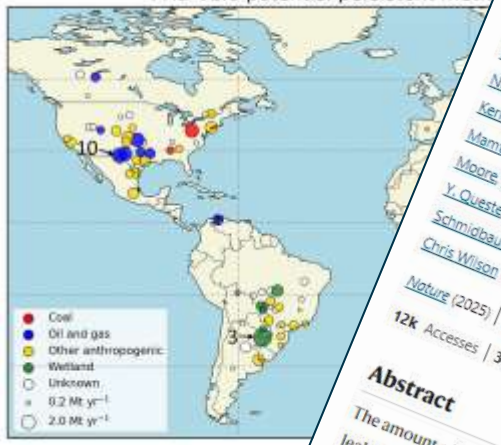
Observing and understanding CH4 sources and sinks

cea esa SMART-CH

Coordinator: Commissariat à l'Energie Atomique et a



PHD v1.0 potential persistent meth



Following E
TROPOM
SWIR/T
emiss
high

ESA SMART-CH4
&
ESA EOWetNet
&
EC IM4CA

Establishing a large European alliance to measure and understand **CH4** emissions

ZON-CL5-2024-D1-01-01 Enhanced
tion and understanding of natural
pogenic methane emissions and

g Methane for
on - IM4CA

CHTING VU

European Commission

cientific basis to observe methane
d assess its progress towards the 30%
duction target

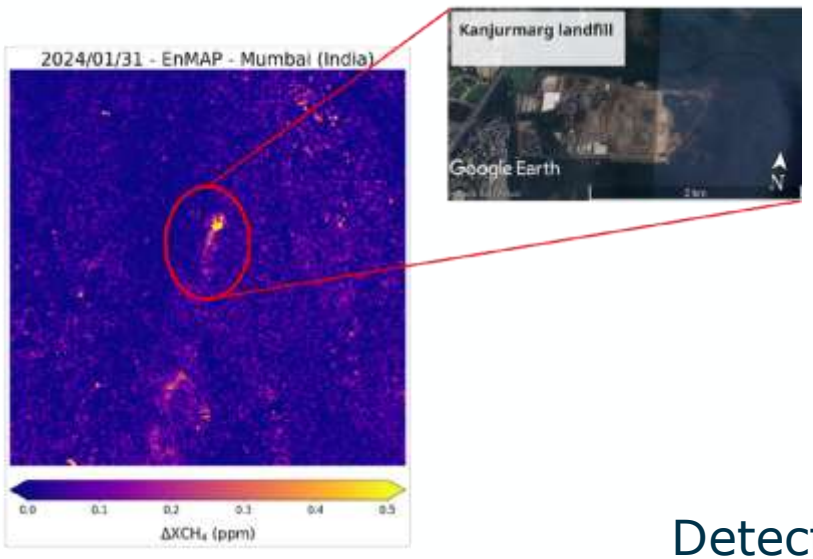
nced understand climate feedbacks on natural
methane sources and sinks, and

Resolving the controversy about the causes for the recent growth rate variations in global methane

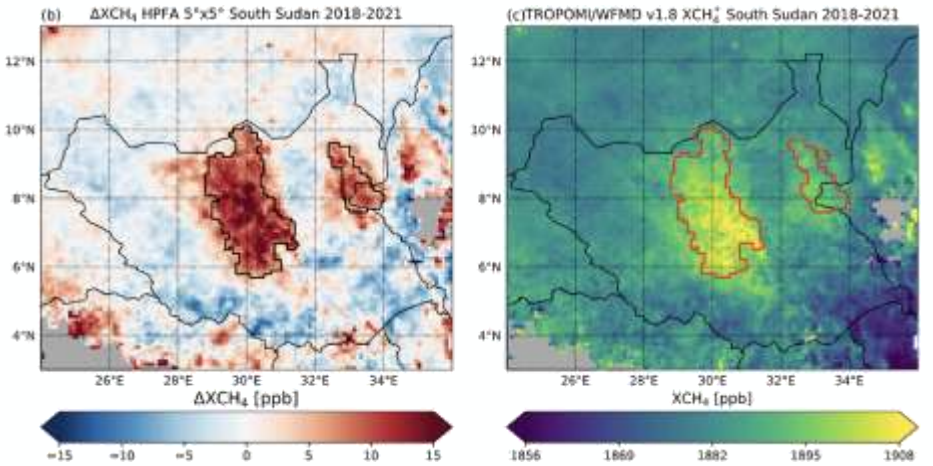
ntinel-5 Precur
e data, Atmos. C
24, 10441–
https://doi.org/10.5
-24-10441-2024, 2024.

SMART-CH4 Intermediate achievements

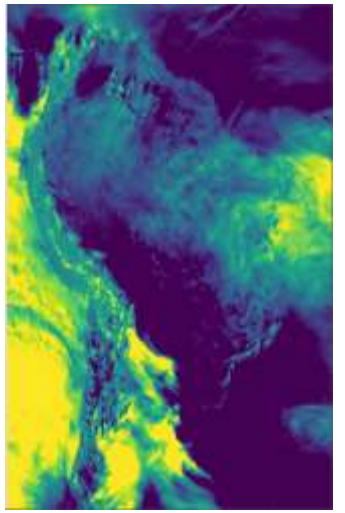
- Improved products for TROPOMI (SRON & IUP-UB), IASI (RAL)
- Test of detectability of landfills using TROPOMI and hyperspectral imagers with application case in Romania
- Deployment of regional and global methane inversions using TROPOMI



EnMAP image of a landfill (UPV)



Detection of persistant methane emitters (IUP-UB)



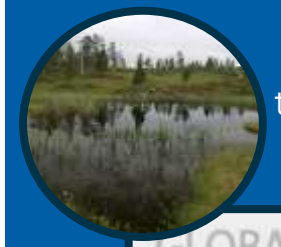
Regional high-resolution inversion in South America (LSCE)

EOWETMET

EO-DRIVEN INSIGHTS FOR ADVANCING ARCTIC WETLAND AND LAKE METHANE EMISSIONS

- Field & EO Data Processing
- EO Feature Extraction
- Wetland and Lake Classification
- Bottom-Up Emission Modelling
- Top-Down Emission Estimation
- Assessment and

AI



Wetlands/lakes are the largest natural source of global methane emissions, the magnitude of which remains poorly understood due to data availability, limited understanding of environmental drivers, and accessibility

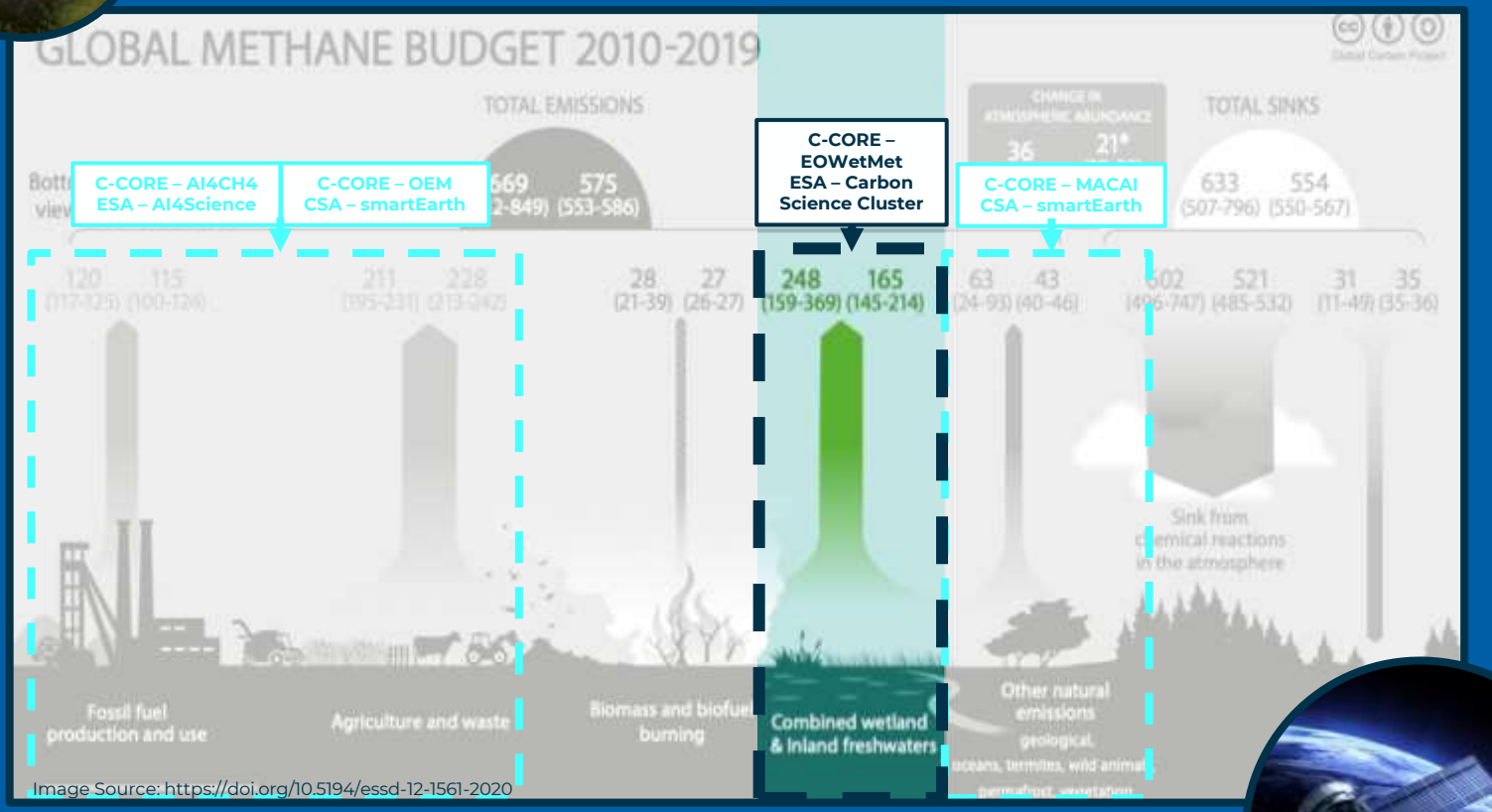


Image Source: https://doi.org/10.5194/essd-12-1561-2020

EOWETMET will further our understanding of wetland and lake CH4 emissions by:

- DEVELOPING METHODS AND MODELS FOR WETLAND AND LAKE METHANE EMISSION USING EO AND AI.
- IMPROVING SPATIAL AND TEMPORAL RESOLUTION OF WETLAND AND LAKE EXTENTS AND DYNAMICS AND ADDRESS DOUBLE-COUNTING.
- PROMOTING COLLABORATION AND SHARE PROJECT RESULTS.

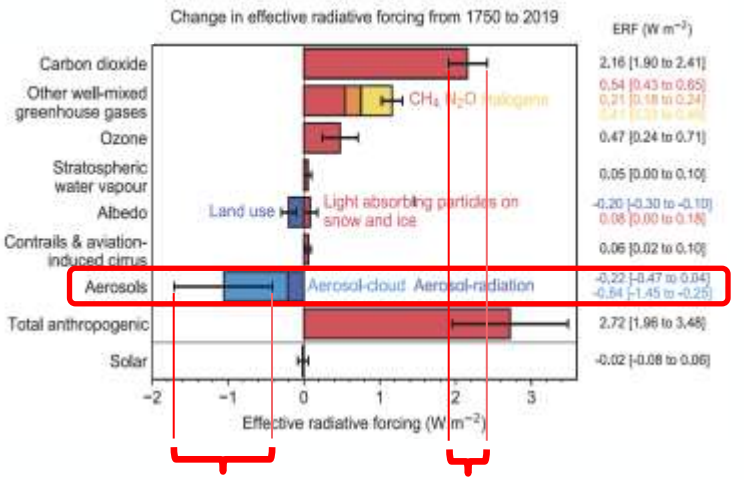
EC-ESA Aerosol Cloud Interaction Alliance…

European Commission | esa

Together, Europe has the largest and most ambitious coordinated effort to address one of the main knowledge gaps in climate science

CleanCloud

20 partners
4 yea
FR
ebruary 2024



AIRSENSE

8 partners, 5 countries
2 years, KO: November 2023
Coord. GRASP FR,

EARTHCARE

Conclusions: Status of the Initiative….

- We have created a unique partnership that brings together the complementarity capabilities of ESA and EC programmes
- We had established an excellent collaboration between both teams…
- We had already several successful stories…
- We have set an ambitious joint programme for 23-24 under implementation that we are following closely to make it work…!
- We still have some margin for improvements: enhanced mechanism for identification of joint priorities and joint work plan preparation, better joint communication of results and opportunities, more efficient modalities of cooperation,…
- Now work focuses on next activities and to identify joint priorities and opportunities for 26-27 that align the new ESA Science Strategy and new Commission priorities…
- <u>We are looking to build alliances for the future, to expand the program</u>

Preliminary Ideas for ESSI New Joint Topics 26-27

AI, Predictability Science, Data Science and Earth Inteligence:
fundation models, data driven simulations, community tools…

carbon cycle

Better understanding and contribution of the land and ocean sinks

Knowledge gaps

Closing knowledge gaps in Climate Science: e.g., Earth radiation budget

extremes

Towards prediction of cascading and concurrent extreme events

ocean health

Science basis for Digital Twin Ocean

polar science

SO and Antarctic cryosphere

Ice-free Arctic

Global Glaciers: World water towers

food systems

Agricultural Modelling from field to global scale

health

Air Quality, Aerosols and Health

biodiversity

Towards a next generation of predictive scenarios of biodiversity